Board of Environmental Protection
Informational Material

- DEP Update // On-going Analysis of Water Quality in Gulf Island Pond

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JOHN ELIAS BALDACCI
GOVERNOR

DAVID P. LITTELL
COMMISSIONER

MEMORANDUM

TO: Board of Environmental Protection

FROM: Dana Murch & Brian Kavanah
Bureau of Land & Water Quality

DATE: August 20, 2009

RE: Update on Gulf Island Pond

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The purpose of this memo is to update the Board on the status of the Department's on-going analysis of water quality in Gulf Island Pond and our proposal for lower point source discharge limits to meet water quality standards in the pond. This memo will also summarize the status of various legal and regulatory proceedings since the Board's February 7, 2008 appeal orders modifying the water quality certification for FPL Energy's Gulf Island-Deer Rips Hydro Project and the wastewater discharge permits for Verso Paper's Jay pulp and paper mill and Rumford Paper's Rumford pulp and paper mill.

February 7, 2008 Orders

In its 2008 appeal Orders, the Board established additional oxygen injection requirements, water quality monitoring requirements, and final pulp and paper mill effluent limits needed to meet Class C water quality standards in Gulf Island Pond based on the Department's 2005 Androscoggin River Total Maximum Daily Load (TMDL) report. The Board also directed the Department to revise and re-calibrate its water quality model following the correction of a dispersive mixing error (which could affect additional oxygen injection requirements) and a recalculation of the sediment area that is contributing phosphorus to the pond (which could affect final effluent limits for total phosphorus and/or ortho-phosphorus. Finally, the Board provided that the parties could fund development and use of a hydro-dynamic model to determine mixing and transport within the pond.

Independently, the Department agreed to evaluate FPL Energy's contention that the Department's water quality model held FPL Energy responsible for mitigating the impact of discharges from upstream municipal wastewater treatment plants on dissolved oxygen levels in Gulf Island Pond.

Appeals of February 7, 2008 Orders

In March 2008, FPL Energy filed a timely appeal in Kennebec County Superior Court of the Board's appeal order for the Gulf Island-Deer Rips Hydro Project. Verso Paper, Rumford Paper, and the Natural Resources Council of Maine have all intervened in the case. The administrative record has been filed and the Court has ruled on a motion by FPL Energy to supplement the agency record. The parties to the case have all agreed to a

stay of the proceedings to allow the Department additional time to complete its modeling effort, as directed by the Board.

In March 2008, NRCM filed and subsequently withdrew an appeal in Kennebec County Superior Court of the Board's appeal order for the Jay pulp and paper mill.

No other appeals were filed.

Hydro-Dynamic Model

In its February 7, 2008 appeal orders, the Board concluded that the development and use of a hydro-dynamic model to determine mixing and transport within Gulf Island Pond may more accurately predict water quality conditions than does the Department's current model, and may result in changes to the effluent limits and additional oxygen injection needed to meet water quality standards in Gulf Island Pond. In its orders, the Board included a condition that, by March 1, 2008, Verso Paper or Rumford Paper may, independently or in cooperation with other parties, provide sufficient funding to the Department for the development and use of a hydro-dynamic model.

Neither Verso Paper nor Rumford Paper provided funding for development of a hydro-dynamic model by the March 1, 2008 deadline. As a result, the Department will continue to use its existing QUAL2E and WASP models to predict dissolved oxygen levels in Gulf Island Pond under various pollutant loading and oxygen injection conditions.

Water Quality Monitoring Plan

In its February 7, 2008 appeal orders, the Board included a condition that, by March 1, 2008, FPL Energy, Verso Paper or Rumford Paper, independently or in cooperation with each other, submit a plan for conducting ambient water quality monitoring, beginning no later than June 1, 2008, to determine compliance with Class C dissolved oxygen standards in Gulf Island Pond, and that this monitoring provide sufficient data to determine the point of thermal stratification in the pond.

On March 1, 2008, FPL Energy submitted a water quality monitoring plan for Gulf Island Pond. This plan included provisions to monitor dissolved oxygen and temperature at one meter intervals from top to bottom at the deepest point in the pond. On March 24, 2008, the Department issued an order approving the monitoring plan as submitted.

Upgrade of Oxygen Injection System

In its February 7, 2008 appeal orders, the Board included a condition that, by June 1, 2008, FPL Energy, Verso Paper or Rumford Paper, independently or in cooperation with each other and Fraser Paper, submit a plan and schedule for upgrading the existing oxygen injection system, located at Upper Narrows in Gulf Island Pond, to increase the oxygen transfer efficiency of the system, thereby increasing dissolved oxygen levels in Gulf Island Pond, and that the upgraded oxygen injection system be operational no later than June 1, 2009.

On May 30, 2008, on behalf of the Gulf Island Pond Oxygenation Project (GIPOP) Partnership (collectively, FPL Energy, Verso Paper, Rumford Paper, and Fraser Paper), FPL Energy submitted a plan and schedule to replace the existing in-stream oxygenation diffuser system with a new line diffuser system designed to improve the oxygen transfer

efficiency of the oxygen injection system from 33% to 54%. On June 23, 2008, the Department issued an order approving the upgrade plan with a condition requiring that the upgraded oxygen injection system continue to be operated in accordance with the approved June 1999 operational plan.

The upgraded system has been installed and began operation in June of 2009.

Review of Zero Point-Source Model Simulations

As agreed, the Department asked its contract modeler, HydroAnalysis, Inc., to determine whether nor not all municipal wastewater treatment plant discharges upstream of Gulf Island Pond were set to zero in the "point sources at zero discharge" model runs included in the 2005 TMDL.

In a June 11, 2008 report to the Department, HydroAnalysis, Inc. determined that the "point sources at zero discharge" model runs had, in fact, set all upstream municipal wastewater treatment plant discharges, as well as all upstream industrial point source discharges, at zero. This means that, in calculating FPL Energy's oxygen injection requirements, the Department did not hold FPL Energy responsible for mitigating the impact of any upstream point source discharge on dissolved oxygen levels in Gulf Island Pond.

Renewal of Fraser Paper Waste Water Discharge Permit

On September 30, 2008, EPA renewed the wastewater discharge permit for Fraser Paper's Gorham, New Hampshire paper mill, subject to reduced effluent limits and increased oxygen injection requirements, based on the Department's 2005 TMDL.

2008 Monitoring Program Report

In January 2009, the Department issued its 2008 Gulf Island Pond Monitoring Program Report. The Department conducted weekly aerial flights and water quality monitoring at one sampling station during the summer of 2008. In addition, weekly monitoring was conducted at five sampling stations on behalf of the GIPOP Partnership.

No algal blooms have been observed in 2007 and 2008. However, while water quality continued to improve, both instantaneous minimum and monthly average Class C dissolved oxygen were not met up to 21% of the time above the point of thermal stratification at several sampling stations. This confirms the need for additional oxygen injection and lower effluent limits as required by the Board's February 2008 appeal orders.

Wausau-Mosinee Mill Shutdown

On April 1, 2009, Wausau Paper announced that its Otis paper mill would be permanently closed by May 31, 2009, and that the mill would be put on the market. Verso Paper currently has a contract to treat the wastewater from the Otis mill at Verso's Jay mill wastewater treatment facility.

In an April 9, 2009 letter to Verso Paper, the Department noted that the Board's February 7, 2008 appeal order for Verso's Jay pulp and paper mill sets forth effluent limits for the Jay mill both with and without the contribution of wastewater from the Wausau-Mosinee

mill. The Department stated that, if the time comes when it is clear that the cessation of Verso receiving wastewater from the Wausau-Mosinee mill for treatment is permanent, then the reduced effluent limits contained in the Board's order for the Jay mill without the contribution of wastewater from the Otis will go into effect.

Gulf Island Pond Model Recalibration

As directed by the Board, the Department asked its contract modeler, HydroAnalysis, Inc., to re-calibrate the Department's water quality model for Gulf Island Pond following (1) the correction of a dispersive mixing error and (2) the recalculation of the sediment area that is contributing phosphorus to the pond.

In an October 31, 2008 report to the Department, as modified on December 18, 2008, HydroAnalysis, Inc. submitted the results of the recalibration work. The recalibrated model increased the vertical dispersion in the pond, thus increasing modeled dissolved oxygen levels in the deeper portions of the pond, in order to more closely match measured dissolved oxygen levels. This in turn would reduce the amount of oxygen injection needed to meet standards. In addition, the recalibrated model decreased the benthic phosphorus loading to the pond, which would allow for an increase in phosphorus loading from point sources without causing algal blooms in the pond.

Assessment of Zero-Discharge Oxygen Injection Requirements and Allowable Phosphorus Load

The Department then asked its contract modeler, HydroAnalysis, Inc., to run the recalibrated water quality model to determine (1) how much oxygen injection would be required to meet dissolved oxygen standards in Gulf Island Pond with all upstream point sources set to zero discharge, and (2) how much phosphorus loadings from point sources could be increased without causing algal blooms.

In an April 2, 2009 report to the Department, HydroAnalysis, Inc. submitted the results of the requested model runs. The results were as follows:

- Oxygen Injection. The recalibrated model predicts that, under low flow conditions and with (1) all upstream point source discharges set to zero and (2) the upgraded oxygen injection system operating at its expected oxygen transfer efficiency of 54%, oxygen injection requirements would be reduced from the 105,000 pounds per day originally predicted by the Department's 2005 model results to 45,000 pounds per day.

- Phosphorus Limits. The recalibrated model predicts that chlorophyll-a concentrations in the pond would remain below the threshold conditions for algal blooms with either (A) an increase of 6 pounds per day in allowable ortho-phosphorus point source loading to the pond, or (B) an increase of 21 pounds per day in allowable organic-phosphorus point source loading to the pond.

Based on these modeling results, the Department has determined that FPL Energy should be responsible for injecting up to 45,000 pounds a day from the upgraded oxygen injection system in order to mitigate the impact of Gulf Island Dam on dissolved oxygen levels in the pond. The Department has also determined that point source loading to Gulf Island Pond of ortho-phosphorus or organic-phosphorus can be increased by 6 pounds per day or 21 pounds per day, respectively, without causing algal blooms in the pond.

Assessment of Oxygen Injection Requirements Under Licensed Discharge Conditions

The Department then asked its contract modeler, HydroAnalysis, Inc., to run the recalibrated water quality model to determine how much oxygen injection would now be required to meet dissolved oxygen standards in Gulf Island Pond with all upstream point sources discharging at their license limits or some other rate representative of a maximum expected discharge.

In an April 13, 2009 report to the Department, HydroAnalysis, Inc. submitted the results of the requested model runs. The results were that, under low flow conditions and with (1) all upstream point source discharging at final license limits and (2) the upgraded oxygen injection system operating at its expected oxygen transfer efficiency of 54%, a total oxygen injection rate of 94,000 pounds a day at Upper Narrows would be needed to meet standards.

Since the existing oxygen injection system has a nominal design capacity of only 73,000 pounds per day, the Department has determined that further reductions in effluent limits and/or additional oxygen injection will be needed to meet standards.

Plan for Additional Oxygen Injection

In its February 7, 2008 appeal orders, the Board included a condition that, by June 1, 2009, FPL Energy, Verso Paper or Rumford Paper, independently or in cooperation with each other and Fraser Paper, submit a plan and schedule for injecting sufficient oxygen into Gulf Island Pond to mitigate the impact of Gulf Island Dam and the Verso and Rumford wastewater discharges on dissolved oxygen levels in the pond, based on the Department's 2005 TMDL, and that the required oxygen injection be provided no later than June 1, 2010. A similar condition was included in EPA's September 30, 2008 wastewater discharge permit for Fraser Paper's Gorham, New Hampshire paper mill.

On May 26, 2009, on behalf of the Gulf Island Pond Oxygenation Project (GIPOP) Partnership, FPL Energy submitted a conceptual plan to provide additional oxygen injection, if required to meet standards, by installing an additional liquid oxygen storage tank and or vaporizer, installing an additional oxygen supply line to Lower Narrows, and relocating and /or installing additional oxygen diffusers in the pond at Lower Narrows.

In a letter dated May 27, 2009, the Department accepted the GIPOP conceptual plan as fulfilling the filing requirements of the Board's appeal orders and EPA permit, pending further discussions with the GIPOP Partnership regarding options for meeting water quality standards without additional oxygen injection.

Proposal for Modified Effluent Limits

By letter dated August 4, 2009 (copy attached), the Department has proposed that final effluent limits for biochemical oxygen demand (BOD) be reduced for the Verso, Rumford, and Fraser mills, and that the final effluent limit for ortho-phosphorus from the Verso mill be increased. The Department has determined that, with adoption of the proposed effluent limits, Gulf Island Pond should not experience algal blooms and should meet Class C dissolved oxygen standards under critical conditions without the need for additional oxygen injection.

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JOHN ELIAS BALDACCI
GOVERNOR

DAVID P. LITTELL
COMMISSIONER

VIA ELECTRONIC MAIL

August 4, 2009

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RE: Gulf Island Pond

Gentlemen:

I am writing to you in your capacities as representatives to the Gulf Island Pond Oxygenation Project (GIPOP) Partnership on behalf of FPL Energy, Verso Paper, Rumford Paper, and Fraser Paper.

As you know, the Department has been working for the last year and a half with its contract modeler, HydroAnalysis, Inc. (HydroAnalysis), to recalibrate the Department's water quality model for Gulf Island Pond and to run the recalibrated model to determine (1) how much oxygen is needed to meet dissolved oxygen standards in the pond and (2) how much phosphorus loading can be allowed from point sources without causing algal blooms in the pond.

HydroAnalysis has now completed the recalibration of the model and all associated model runs requested by the Department. Based on our review of this work, the Department is making the following proposal for modifications in final effluent limits and/or oxygen injection requirements for the Verso, Rumford, and Fraser mills and the Gulf Island-Deer Rips Hydro Project to meet water quality standards in Gulf Island Pond under critical conditions.

Phosphorus

As described in an April 2, 2009 report to the Department, which was previously distributed to all the parties, HydroAnalysis submitted the results of a model run to determine how much phosphorus loadings from point sources could be increased without causing algal blooms in Gulf Island Pond. The recalibrated model predicts that chlorophyll-a concentrations in the pond would remain below the threshold conditions for algal blooms with either (A) an increase of 6 lbs per day in allowable ortho-phosphorus

point source loading to the pond, or (B) an increase of 21 lbs per day in allowable organic-phosphorus point source loading to the pond.

Final effluent limits for phosphorus are already in effect for the Rumford and Fraser mills and are currently being met. As a result, in accordance with the anti-backsliding provisions of state and federal regulations, these limits cannot be made less stringent. However, final effluent limits for phosphorus for the Verso mill are not scheduled to take effect until June 1, 2010. The interim and final phosphorus limits for the Verso mill are summarized below:

	Beginning June 1, 2008	Beginning June 1, 2010
Monthly Average Total Phosphorus[1] Limits (June 1 – September 30)	150 lbs/day	130 lbs/day
Monthly Average Ortho-Phosphorus Limits (June 1 – September 30)	33 lbs/day	22 lbs/day

Given that current modeling shows that point source phosphorus loadings can be increased without causing algal blooms, and given that Verso has testified that it is most concerned about its long-term ability to meet more stringent ortho-phosphorus limits, the Department is prepared to modify the permit for the Verso mill to increase the final effluent limit for ortho-phosphorus from 22 lbs/day to 28 lbs/day, effective June 1, 2010, subject to the condition that, based on future water quality monitoring, DEP reserves the right to reopen and modify the permit to require reduced effluent limits as deemed necessary to prevent algal blooms in Gulf Island Pond.

BOD and Oxygen Injection

As described in an April 2, 2009 report to the Department, which was previously distributed to all the parties, HydroAnalysis submitted the results of a model run to determine how much oxygen injection would be required to meet dissolved oxygen standards in Gulf Island Pond with all upstream point sources set to zero discharge. The recalibrated model predicts that Class C dissolved oxygen standards would be met in Gulf Island Pond to a depth of 60 feet (the point of topographic isolation in the pond, per DEP's 2005 TMDL) with the injection of 45,000 lbs/day of oxygen at Upper Narrows.[2] Based on these modeling results, the Department has determined that FPL Energy should be responsible for injecting up to 45,000 lbs/day of oxygen from the upgraded oxygen injection system in order to mitigate the impact of Gulf Island Dam on dissolved oxygen levels in the pond.

As described in an April 13, 2009 report to the Department, which was previously distributed to all the parties, HydroAnalysis then submitted the results of model runs to determine, under low flow conditions and with all upstream point sources at final license limits, how much oxygen injection would be required to meet Class C dissolved oxygen

[1] Total phosphorus equals organic phosphorus plus ortho-phosphorus.

[2] This modeling assumes oxygen injection at an oxygen transfer efficiency of 54%, which is the expected efficiency of the upgraded oxygen injection system that began operation in June of this year.

standards in Gulf Island Pond to a depth of 60 feet. The results of this modeling work are summarized below.[3]

	VERSO	RUMFORD	FRASER	Oxygen Injection
Current Monthly Average BOD Limits (June 1 – September 30)	4500 lbs/day[4]	8330 lbs/day	9149 lbs/day	94,000 lbs/day

At the expected oxygen transfer efficiency of the upgraded oxygen injection system of 54%, an oxygen injection rate of 94,000 lbs/day would result in the transfer of 50,760 lbs/day of oxygen into the waters of Gulf Island Pond.

The existing oxygen injection system has a nominal design capacity of only 73,000 lbs/day. The Department notes that, under the operational plan for the GIPOP injection system that has been in effect since 1999, the system is operated under certain low flow/high temperature conditions at 125% of its nominal design capacity. While this mode of operation results in a reduction in overall oxygen transfer efficiency, it does result in an increase in the amount of oxygen transferred into the water column in the pond. However, the total oxygen transfer is still only 40,950 lbs/day, which is 19.3% less than the amount of oxygen needed to meet Class C standards under current effluent limits. Therefore, further reductions in effluent limits and/or additional oxygen injection will be needed to meet Class C dissolved oxygen standards in Gulf Island Pond.

After consideration of recent mill performance and production capacity, and after an additional model run by HydroAnalysis, the Department proposes the following reduced BOD limits for the Verso, Rumford, and Fraser mills to meet dissolved oxygen standards in Gulf Island Pond without the need for additional oxygen injection.

	VERSO	RUMFORD	FRASER	Oxygen Injection
Proposed Monthly Average BOD Limits (June 1 – September 30)	4150 lbs/day[5]	4150 lbs/day	5500 lbs/day	79,400 lbs/day

[3] Please note that, for modeling purposes, weekly average BOD limits were used. These have been converted here to monthly average limits, which are lower.

[4] This limit includes the historic contribution of wastewater from the Wausau-Mosinee Otis paper mill to the Verso wastewater treatment facility. The Otis mill was closed in May 2009 and is on the market. If the cessation of Verso receiving wastewater from the Otis mill for treatment becomes permanent, Verso's monthly average summer BOD limit drops to 4150 lbs/day.

[5] Even with the Otis mill potentially reopening, the Department believes that both Verso and Rumford can meet the proposed monthly average BOD limit of 4150 lbs/day. The Department recognizes that other distributions of BOD limits among the paper mills may accomplish the same reduction in loadings to Gulf Island Pond.

A copy of the July 1, 2009 report from HydroAnalysis confirming that dissolved oxygen standards will be met under these discharge and oxygen injection conditions is attached.[6]

Assuming that FPL Energy is responsible for injecting up to 45,000 lbs/day of oxygen, Verso, Rumford and Fraser would be responsible for injecting the balance of the required 79,400 lbs/day of oxygen based on each mill's contribution to the BOD loading to the pond at the proposed limits,[7] as follows.

	FPL ENERGY	VERSO	RUMFORD	FRASER
Oxygen Injection Required (% to total)	45,000 lbs/day (57%)	15,338 lbs/day (19%)	11,116 lbs/day (14%)	7,945 lbs/day (10%)

The Department expects that the cost allocation for oxygen injection in the current GIPOP Partnership agreement can be adjusted to reflect these new oxygen injection responsibilities.[8]

At a presumed oxygen transfer efficiency of 54%, an oxygen injection rate of 79,400 lbs/day would result in the transfer of 42,876 lbs/day of oxygen into the waters of Gulf Island Pond. Operating at 125% of nominal design capacity, as discussed above, the upgraded oxygen injection system will transfer 40,950 lbs/day of oxygen into the water column in the pond. This is 95.5% of the oxygen injection rate predicted by the Department's recalibrated model as being needed to meet standards at the proposed reduced BOD limits, and is within the explicit 10% margin of safety that is built into the model.

An analysis of the recent performance of the Verso, Rumford, and Fraser mills indicates that the proposed limits are already being met, even with historic loading to the Verso wastewater treatment plant from the Otis mill (see attached BOD discharge charts).

The proposed limits treat the Verso and Rumford mills equally, based on the nearly identical production capacity of these two mills. This does not reflect the fact that the Rumford mill is further away from, and thus has a smaller impact on, Gulf Island Pond. However, any increase in BOD limits above 4150 lbs/day for Rumford may require a further decrease in BOD limits below 4150 lbs/day for Verso and possibly below 5500 lbs/day for Fraser.

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[6] Again, for modeling purposes, weekly average BOD limits were used. These have been converted here to monthly average limits, which are lower.

[7] Using the assimilation factors from the 2005 TMDL, BOD loadings from the three paper mills to Gulf Island Pond at the proposed limits are as follows: Verso Paper—9,411 lbs/day (45% of total); Rumford Paper—6,843 lbs/day (32% of total); and Fraser Paper—4,891 lbs/day (23% of total).

[8] Under the current GIPOP Partnership Agreement, annual operating and maintenance expenses, including the cost of purchasing, storing, and injecting oxygen into Gulf Island Pond, are paid under the following allocation formula: FPL Energy-14%; Verso Paper-38%; Rumford Paper-38%; and Fraser Paper-10 %.

Given the significant investment that has been made in the upgrade of the existing oxygen injection system, and given that any requirement for additional oxygen injection will come at significant capital cost and on-going annual operation and maintenance costs, and given that an adequate margin of safety can be maintained, the Department is prepared to modify the certification for the Gulf Island-Deer Rips hydropower project and the permits for the Verso and Rumford mills, and to have EPA modify the permit for the Fraser mill, to adopt the reduced BOD limits discussed above and delete the current requirements for additional oxygen injection, effective June 1, 2010, subject to the condition that, based on future water quality monitoring, DEP and EPA reserve the right to reopen and modify the certification and permits to require reduced effluent limits and/or oxygen injection rates as deemed necessary to meet dissolved oxygen standards in Gulf Island Pond.

If the reduced BOD limits discussed above, or alternative limits that will also result in standards being met while maintaining an adequate margin of safety, are not acceptable, then Verso, Rumford and Fraser will each be required to submit a new 125.3(f) demonstration that the alternative of additional oxygen injection is the preferred environmental and economic alternative to achieve water quality standards after consideration of other available alternatives, including additional treatment.[9] Both the Department and EPA will then have to review and approve this demonstration. Given the performance of the mills to date, it is not clear that such a demonstration would be approved. If the new 125.3(f) demonstration is approved, then the GIPOP Partnership will be required to inject an additional 21,000 lbs/day of oxygen at Upper Narrows or an additional 13,000 lbs/day at Lower Narrows, at an oxygen transfer efficiency rate of 54% or equivalent rates at an alternative transfer efficiency, in order to meet Class C dissolved oxygen standards in Gulf Island Pond.

Schedule for Modifications

Consistent with the Board of Environmental Protection's February 7, 2008 appeal orders, final effluent limits and oxygen injection requirements sufficient to meet Class C dissolved oxygen standards and prevent algal blooms in Gulf Island Pond must be in effect within the term of the current wastewater discharge permits for the Verso and Rumford mills. These permits are set to expire on September 21, 2010.

The Department has confirmed with EPA that the 2005 TMDL must be modified to reflect the changes to the model made by HydroAnalysis and any changes in effluent limits and/or oxygen injection requirements.

Based on these considerations, the Department proposes the following schedule to modify the existing permits, certification, and TMDL.

[9] The need for a new 125.3(f) demonstration by each of the mills has been confirmed with EPA and the AG's Office.

By September 1, 2009	DEP & GIPOP Partnership agree to reduced effluent limits sufficient to meet dissolved oxygen standards without additional oxygen injection. DEP & Verso agree to increased final effluent limits for phosphorus.
By September 30, 2009	DEP submits preliminary draft TMDL modifications to EPA for review.
By October 30, 2009	DEP issues proposed draft modifications of water quality certification for Gulf Island-Deer Rips Hydro Project and wastewater discharge permits for Verso and Rumford mills. EPA issues proposed draft modification of wastewater discharge permit for Fraser mill. DEP issues draft TMDL for public comment.
By December 15, 2009	DEP submits final TMDL modifications to EPA for review and approval.
By January 30, 2010	EPA approves TMDL modifications.
By February 15, 2010	DEP issues final modifications of water quality certification for Gulf Island-Deer Rips Hydro Project and wastewater discharge permits for Verso and Rumford mills. EPA issues final modification of wastewater discharge permit for Fraser mill.
On June 1, 2010	Reduced effluent limits for BOD at Verso, Rumford and Fraser mills and increased final effluent limits for phosphorus at Verso mill go into effect.

If reduced effluent limits sufficient to meet dissolved oxygen standards without additional oxygen injection are not acceptable, then the DEP proposes the following schedule for review of the alternative of additional oxygen injection.

By September 30, 2009	Verso, Rumford, and Fraser each submit a new 125.3(f) demonstration that the alternative of additional oxygen injection is the preferred environmental and economic alternative to meet dissolved oxygen standards.
By October 30, 2009	DEP & EPA approve or disapprove new 125.3(f) demonstrations. DEP develops schedule to modify the existing permits, certification, and TMDL in accordance with 125.3(f) approval or disapproval.

By November 30, 2009	If new 125.3(f) demonstrations are approved, then GIPOP Partnership submits final design plans for additional oxygen injection to meet dissolved oxygen standards.
By December 30, 2009	DEP approves plans for additional oxygen injection.
By June 1, 2010	Additional oxygen injection system in place and ready for operation.

If you have any questions or comments, please contact me by telephone at 207-287-7784 or by email at dana.p.murch@maine.gov.

Thank you for your continued attention to this important matter.

Sincerely,

Dana Paul Murch

Dana Paul Murch
Dams & Hydropower Supervisor

Attachments
cc: David Littell, Commissioner, DEP
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Gregg Wood, DEP
Rob Mohlar, DEP
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July 1, 2009

Ref: J418-011

Mr. Dave Courtemanch
Maine Department of Environmental Protection
Bureau of Land and Water Quality
17 Statehouse Station
Augusta, Maine 04333-0017

Re: Impacts on oxygen injection requirements to reductions in BOD discharge from paper mills

Dear Mr. Courtemanch:

At your request (Courtemanch, 2009) I have analyzed the impacts of reducing the paper mill five day biochemical oxygen demand (BOD_5) discharge loads to the following proposed summer limits shown in Table 1. The right-hand column of Table 1 presents the BOD_5 loads previously analyzed in Jacobs (2009).

Table 1. Simulated BOD_5 Discharge Rates at Paper Mills on Androscoggin River.

Facility	Weekly Average BOD_5 Limit (pounds per day)	Previously analyzed BOD_5 Loads (pounds per day)
Verso	5,900	6,400
Rumford	5,900	12,500
Fraser	6,190	10,298

In doing these calculations, I have employed the same procedure as described previously in Jacobs (2009). First, the BOD loading rates that had been specified in the QUAL2E model of the Androscoggin River were modified using the weekly average BOD_5 point loads from Table 1. These rates are reductions from the point load discharge rates that were described in Jacobs (2009) as the "permitted rate or some other rate representative of a maximum expected condition." The simulated discharge rates and concentrations for the point sources are shown in Table 2. This table is identical to Table 6 of Jacobs (2009), with the exception of the BOD_u concentrations for the three paper mills. In calculating the BOD_u concentrations, the ratios of BOD_U/ BOD_5 in the mill effluent were set according to the values specified in Table 8 of Mitnik (2005).

Table 2. Simulated Discharge Rate and Concentration

Source	Discharge Flow (cfs)	BOD_U (mg/L)	Organic N (mg/L)	Ammonia-N (mg/L)	Nitrate-N (mg/L)	Ortho-phosphate (mg/L)	Organic Phosphorus (mg/L)
Towns							
Berlin	4.09	135	9.0	6.3	2.0	0.78	0.12
Gorham	1.16	135	5.4	10.8	2.0	1.9	0.16
Bethel	0.53	135	5.4	10.8	2.0	2.72	0.28
Rumford-Mex	4.1	135	2.5	17.2	2.7	1.22	0.2
Livermore Falls	3.1	135	4.7	8.87	1.18	0.50	0.08
Mills							
Fraser Cascade	23.2	178	2.6	1.78	0.1	0.65	0.38
Rumford	52.6	75	2.1	2.08	0.13	0.34	0.19
Verso	78.9	50	4.7	2.67	0.08	0.05	0.25

The QUAL2E model was run and the simulated BOD_u and dissolved oxygen (DO) concentrations from the downstream end of the model were calculated as 4.27 mg/L and 6.72 mg/L respectively. These concentrations were entered as upstream concentrations to the WASP model of the Gulf Island Pond. This model was then run and the resulting simulated dissolved oxygen concentrations were used to ascertain whether the regulatory standard of 5 mg/L DO was achieved at each node shallower than a depth of 60 feet.

The simulated rate of oxygen injection at the Upper Falls was then adjusted in order to determine the minimum rate of oxygen injection that would result in compliance with the DO regulatory standard. Figure 1 shows the minimum segment concentration at points downstream of the Upper Narrows and shallower than a depth of 60 feet as a function of the simulated rate of oxygen injection. As in Jacobs (2009), the transfer efficiency of the injected oxygen was assumed to be at a rate of 54 percent.

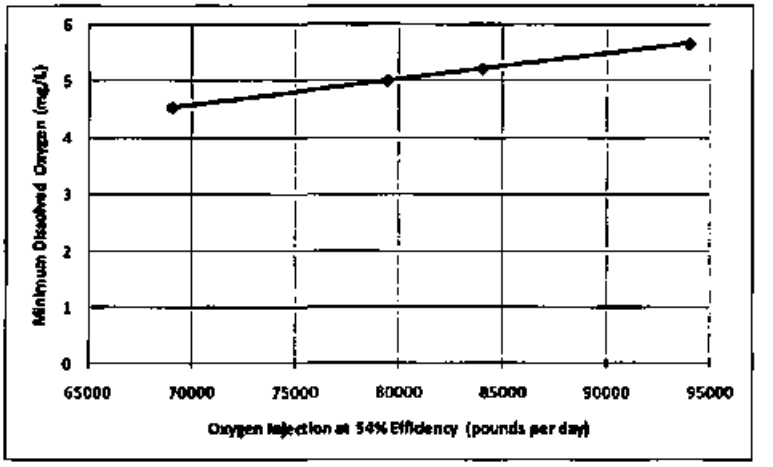

Figure 1. Model-wide minimum dissolved oxygen concentration above a depth of 60 feet as a function of rate of oxygen injection at Upper Narrows

The regulatory standard was achieved at a rate of oxygen injection of 79,400 pounds per day. Figure 2 shows the simulated segment-by-segment concentration from the water quality model of Gulf Island Pond for this rate of oxygen injection and for point source discharge rates as shown in Table 2.

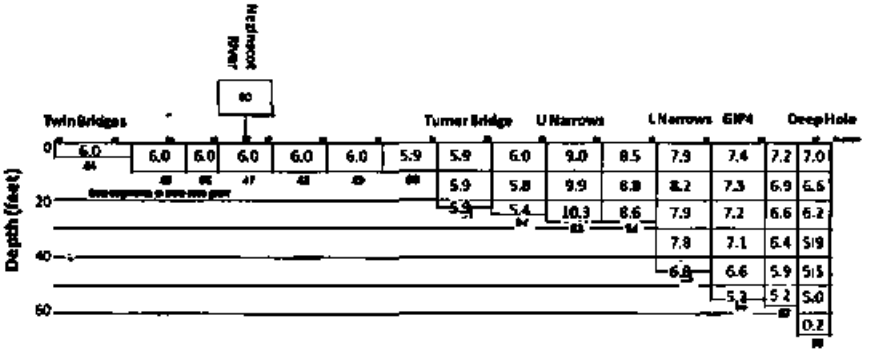

Figure 2. Simulated dissolved oxygen concentrations at 7Q10 flow with oxygen injection at Upper Narrows of 79,400 pounds per day with transfer efficiency of 54 percent

Please contact me should you have any questions on the analysis presented in this letter.

Sincerely,

Bruce Jacobs

Bruce L. Jacobs, Ph.D., P.E.

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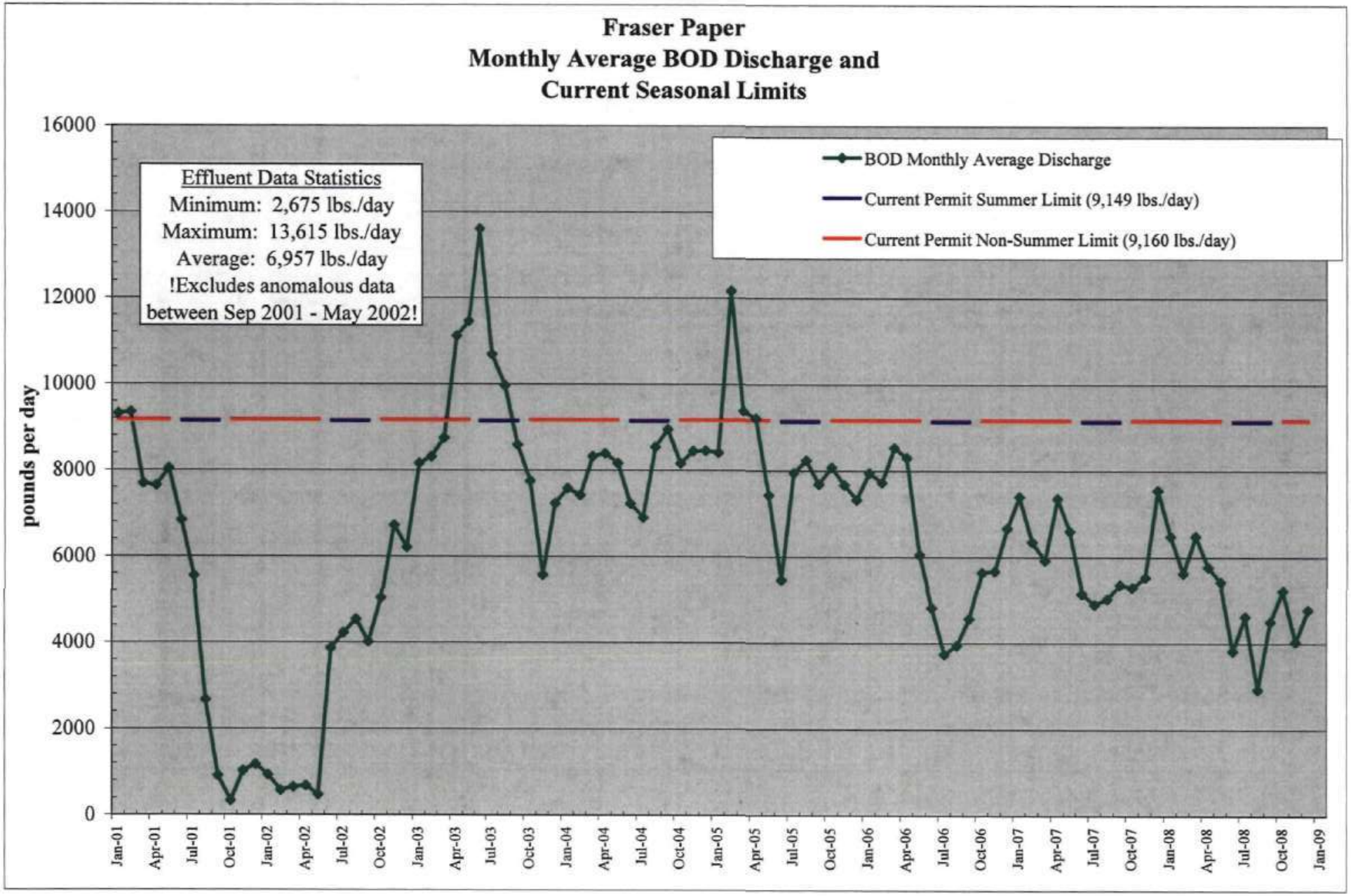
Fraser Paper
Monthly Average BOD Discharge and Current Seasonal Limits



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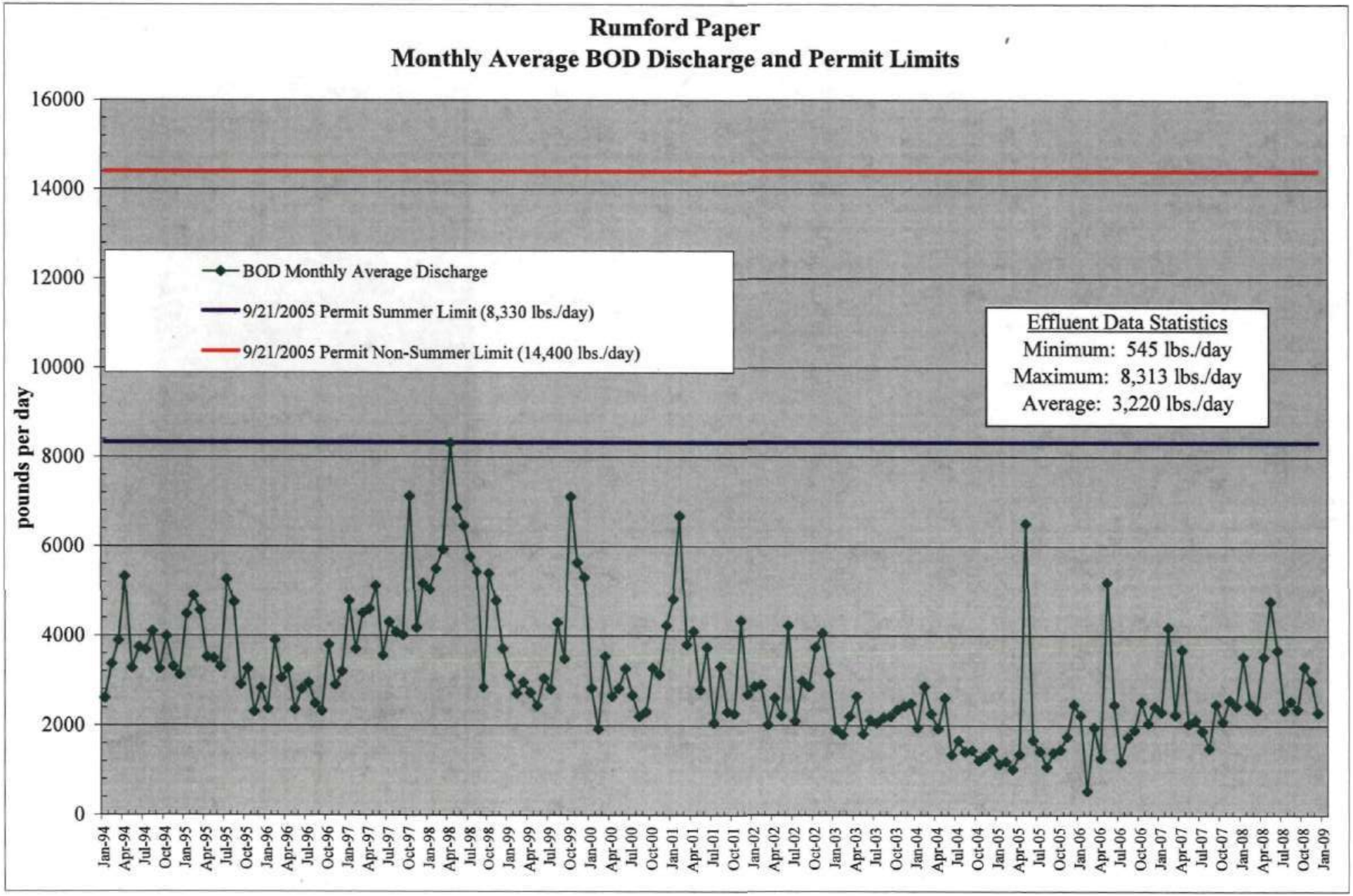

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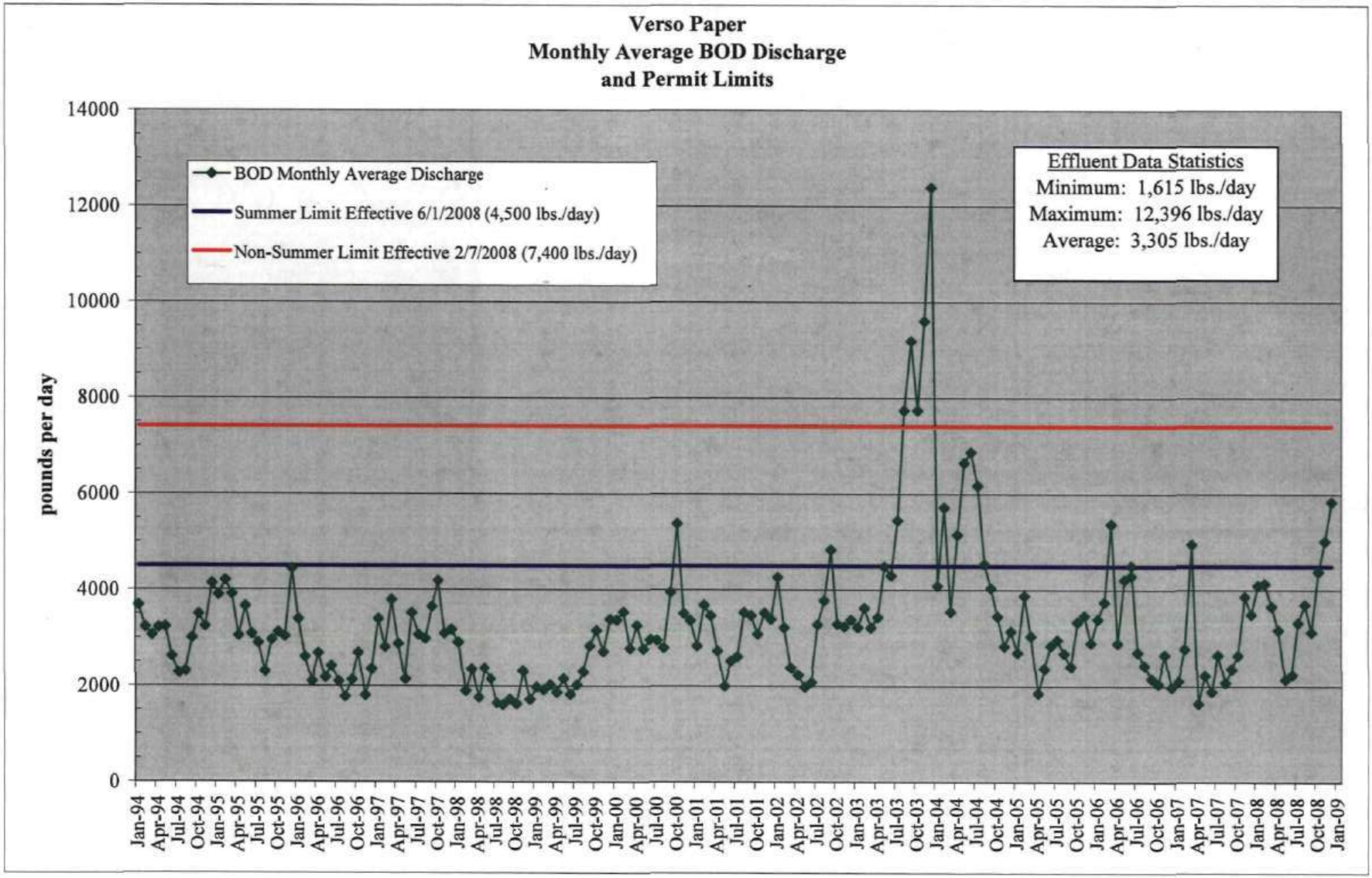
Verso Paper
Monthly Average BOD Discharge and Permit Limits



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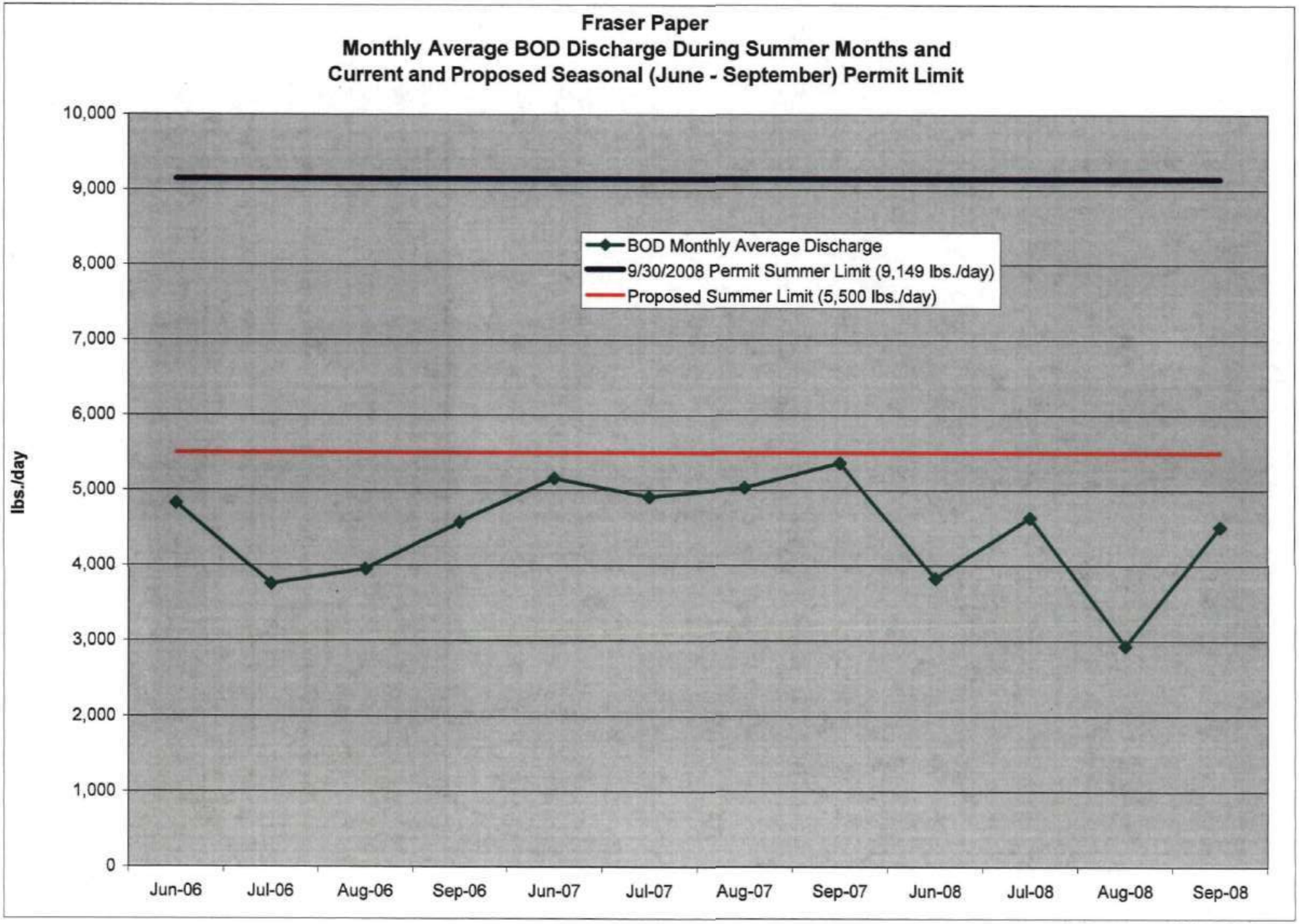
Fraser Paper
Monthly Average BOD Discharge During Summer Months and Current and Proposed Seasonal (June - September) Permit Limit



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Rumford Paper
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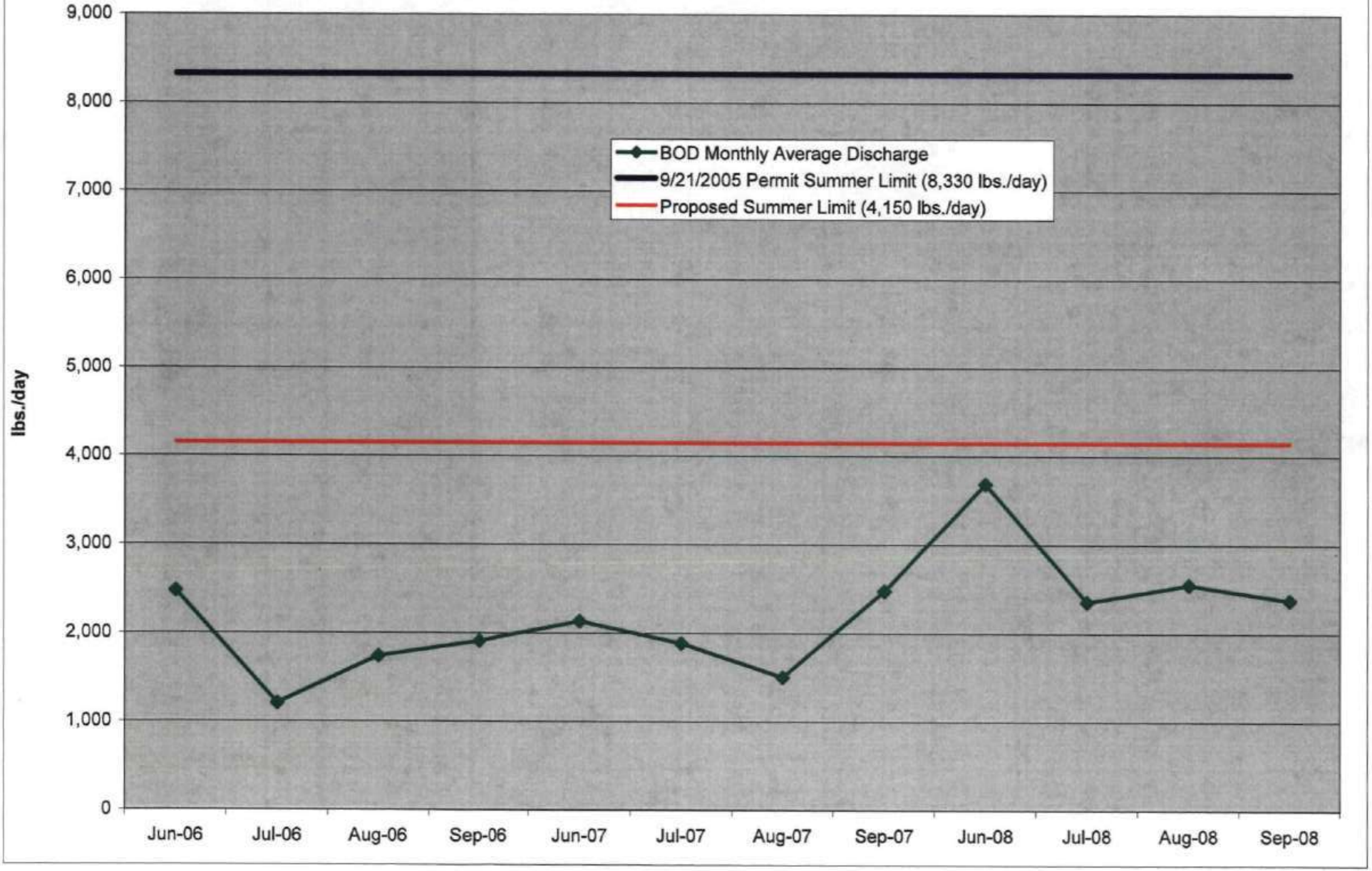

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Monthly Average BOD Discharge During Summer Months and
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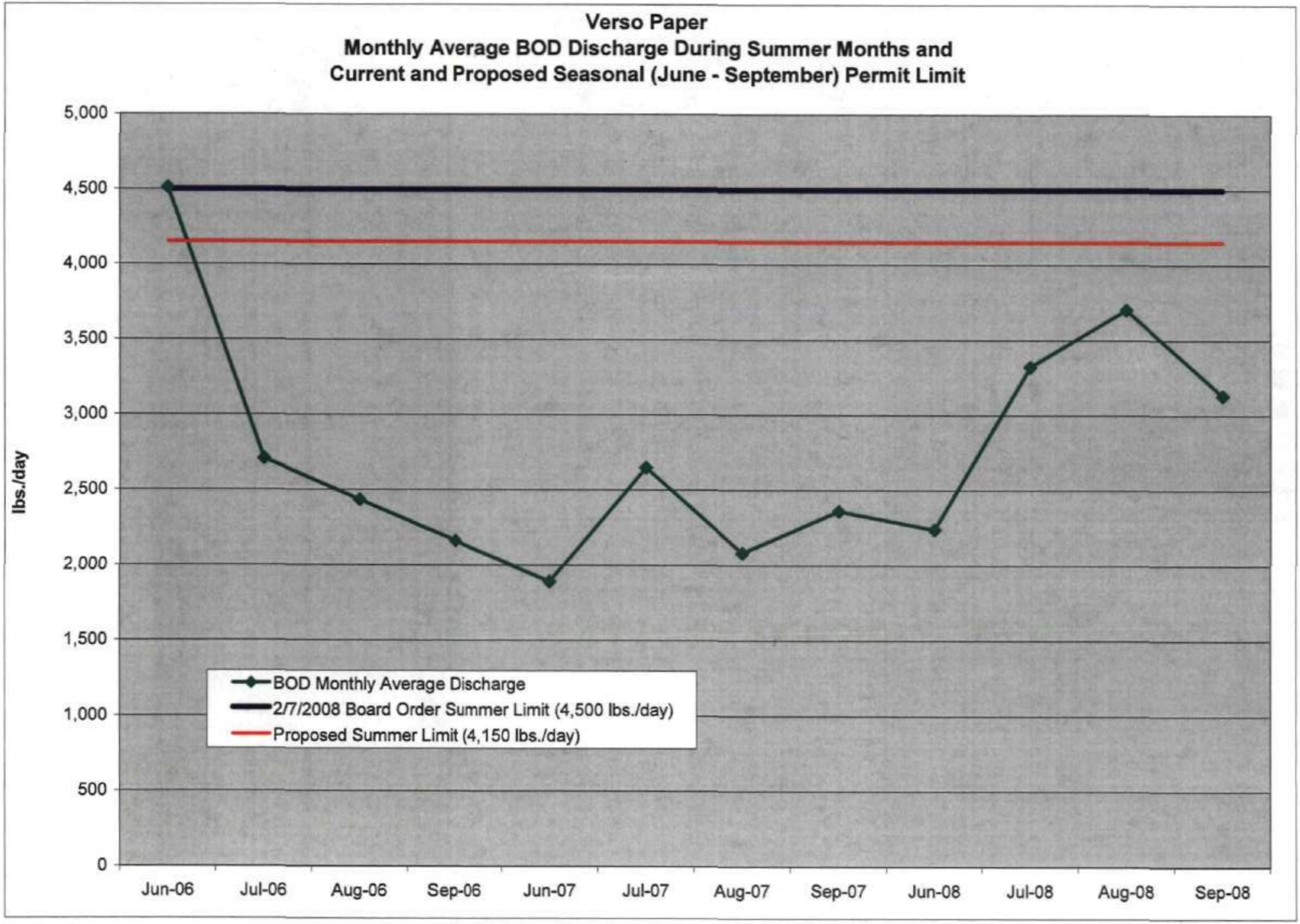

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